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WESTINGHOUSE AP1000® GENERIC DESIGN ASSESSMENT

GDA ISSUE

PMS SPURIOUS OPERATION

GI-AP1000-CI-04 REVISION 0

Technical Area	**CONTROL AND INSTRUMENTATION**		
Related Technical Areas	Fault Studies		
GDA Issue Reference	**GI-AP1000-CI-04**	**GDA Issue Action Reference**	**GI-AP1000-CI-04.A1**
GDA Issue	The PMS has the capability to actuate any of the Engineered Safety Features (ESF) on the AP1000. This includes the potential to spuriously actuate the Automatic Depressurisation System (ADS) valves or the containment recirculation valves. The spurious operation of these functions has the potential to initiate safety significant transients such as a large LOCA or drainage of the in-containment refuelling water storage tank (IRWST). Westinghouse needs to provide a design basis safety case covering such spurious actuations. Westinghouse has proposed implementing an interlock/blocker to reduce the ADS spurious initiating frequency. Westinghouse needs to formally introduce the design change, complete the design and provide a substantiation of the claims made on the blocker device. For further guidance, see T17.TO1.01 in Annex 7 of ONR C&I Assessment Report No. 11/006 (draft).		
GDA Issue Action	Westinghouse to provide a design basis safety case covering spurious PMS actuation of the ADS valves. The safety case will need to demonstrate that the ADS interlock/blocker device provides adequate protection against such faults or provide additional protection or justification as to why the position is acceptable. For the US design the PMS reliability claim is such that these events are outside the plant design basis; however, the UK design makes a lower claim on the PMS reliability, hence, there is a higher assumed dangerous failure rate bringing these events within the design base. The safety case will need to recognise the effectiveness of the blocker device may well be limited by the reliability of the CIM and so additional protection might be required. With agreement from the Regulator this action may be completed by alternative means.		

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Technical Area	**CONTROL AND INSTRUMENTATION**		
Related Technical Areas	None		
GDA Issue Reference	**GI-AP1000-CI-04**	**GDA Issue Action Reference**	**GI-AP1000-CI-04.A2**
GDA Issue Action	Westinghouse is required to provide a design basis safety case covering spurious operation of the containment recirculation squib valves. Westinghouse needs to demonstrate that adequate protection is provided or propose possible design changes to reduce the initiating frequency of the event and/or provide additional protection. The safety case needs to provide a full deterministic and probabilistic assessment to demonstrate that the risk of serious consequences following spurious operation of the recirculation valves is below the design basis sequence cut-off frequency of 10^{-7} per year while ensuring the reliability of recirculation valves to perform their important safety function has not been significantly affected. Westinghouse has identified that spurious operation of the PMS can potentially result in the inadvertent opening of the containment recirculation squib valves causing the draining of the IRWST. If these valves are not isolated by the operator such a fault has the potential to: • flood the containment sump (possibly resulting in RCP trip and consequential reactor trip), and; • result in the consequential failure of the PRHR heat exchanger and the IRWST safety injection system which are the two Class A1 post-trip cooling systems on the AP1000. It is not clear that this situation meets Westinghouse's own design criteria, which is that for every design basis fault there should be at least one Class A1 safety system to protect against the fault and that operator actions should not be required for at least 72 hours. Should Westinghouse choose to implement the blocker device in a similar manner to that applied on the ADS valves then the safety case needs to recognise that the effectiveness of the blocker device may be limited by the reliability of the CIM and so additional protection may well be required. With agreement from the Regulator this action may be completed by alternative means.		

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Technical Area	**CONTROL AND INSTRUMENTATION**		
Related Technical Areas	None		
GDA Issue Reference	**GI-AP1000-CI-04**	**GDA Issue Action Reference**	**GI-AP1000-CI-04.A3**
GDA Issue Action	Westinghouse to formally introduce the change to the PMS design to introduce the interlock/blocker on the ADS valves via the design change process (DCP). With agreement from the Regulator this action may be completed by alternative means.		

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GI-AP1000-CI-04 REVISION 0

Technical Area	**CONTROL AND INSTRUMENTATION**		
Related Technical Areas	None		
GDA Issue Reference	**GI-AP1000-CI-04**	**GDA Issue Action Reference**	**GI-AP1000-CI-04.A4**
GDA Issue Action	Westinghouse to complete the design of the interlock/blocker and substantiate it for its intended role. Westinghouse presented, in three notes, a concept design for interlocking/blocking the actuation of the ADS 1 to 4 valves using a signal based on measurement of the level of the core makeup tank fed into the existing PMS CIM Z port. ONR reviewed the design concept and comments were provided to Westinghouse. However, the design and design substantiation need to be completed. The design substantiation should include an evaluation of the ADS 1 to 4 valve spurious operation rates (accounting for sensor failure and PMS test and maintenance activities). With agreement from the Regulator this action may be completed by alternative means.		